

Actively Cooled Silicon Lightweight Mirrors for Far Infrared and Submillimeter Optical Systems, Phase I

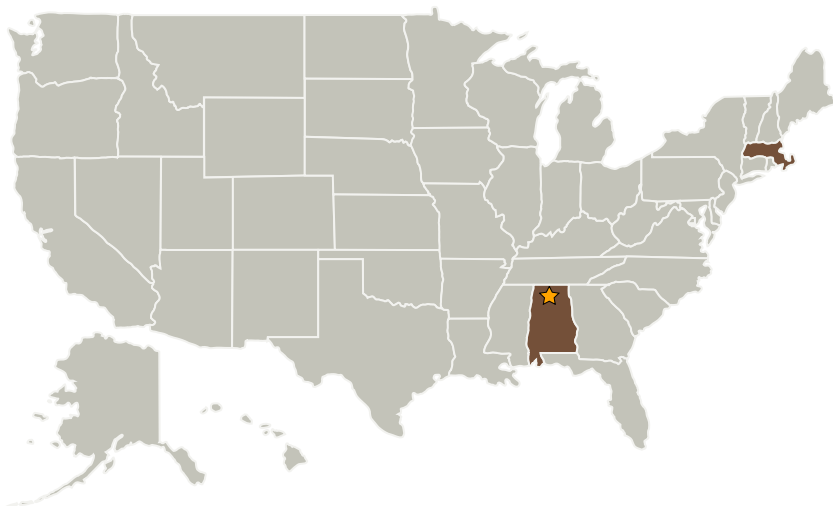
Completed Technology Project (2004 - 2004)



Project Introduction

Schafer proposes to demonstrate 2 different methods for actively cooling our 5-7.5 kg/m² areal density Silicon Lightweight Mirrors (SLMS?) technology for future NASA far infrared and sub-millimeter missions. In Phase I, direct internal cooling will be demonstrated by directly flowing liquid nitrogen through the continuous open cell core of the SLMS?. Indirect external cooling will be demonstrated by flowing liquid nitrogen through a CTE matched C/SiC manifold that is bonded about the circumference of the SLMS?. During Phase II we plan to exercise our Space Act Agreement to helium test the SLMS? at NASA MSFC XRCF. Previously, under Contract No. NAS8-01174 entitled, "Silicon Lightweight Mirrors (SLMs) for Ultraviolet and Extreme Ultraviolet Imaging Mirrors" performed for Drs. Andrew Keys and Phil Stahl, Schafer produced a SLMS? UV Demonstrator Mirror (UVD) with 9.8 kg/m² areal density, 0.021 waves rms HeNe figure accuracy, and 4 ? rms surface roughness. The SLMS? UVD was cryo-tested from 300 K to 27 K at NASA MSFC in the 4-foot XRCF chamber on 2 separate occasions, once uncoated and once with a multiple-layer dielectric coating. We demonstrated extreme dimensional stability with a relative deformation < /60 rms HeNe for the 275 K temperature excursion.

Primary U.S. Work Locations and Key Partners



Actively Cooled Silicon
Lightweight Mirrors for Far
Infrared and Submillimeter
Optical Systems, Phase I

Table of Contents

Project Introduction	1
Primary U.S. Work Locations and Key Partners	1
Organizational Responsibility	1
Project Management	2
Technology Areas	2

Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission
Directorate (STMD)

Lead Center / Facility:

Marshall Space Flight Center
(MSFC)

Responsible Program:

Small Business Innovation
Research/Small Business Tech
Transfer

Actively Cooled Silicon Lightweight Mirrors for Far Infrared and Submillimeter Optical Systems, Phase I

Completed Technology Project (2004 - 2004)



Organizations Performing Work	Role	Type	Location
★ Marshall Space Flight Center(MSFC)	Lead Organization	NASA Center	Huntsville, Alabama
Schafer Corporation	Supporting Organization	Industry	Chelmsford, Massachusetts

Primary U.S. Work Locations	
Alabama	Massachusetts

Project Management

Program Director:

Jason L Kessler

Program Manager:

Carlos Torrez

Principal Investigator:

William D Goodman

Technology Areas

Primary:

- TX14 Thermal Management Systems
 - └ TX14.1 Cryogenic Systems
 - └ TX14.1.3 Thermal Conditioning for Sensors, Instruments, and High Efficiency Electric Motors